$\frac{d}{dx}\ 4\cos + 3\sin$

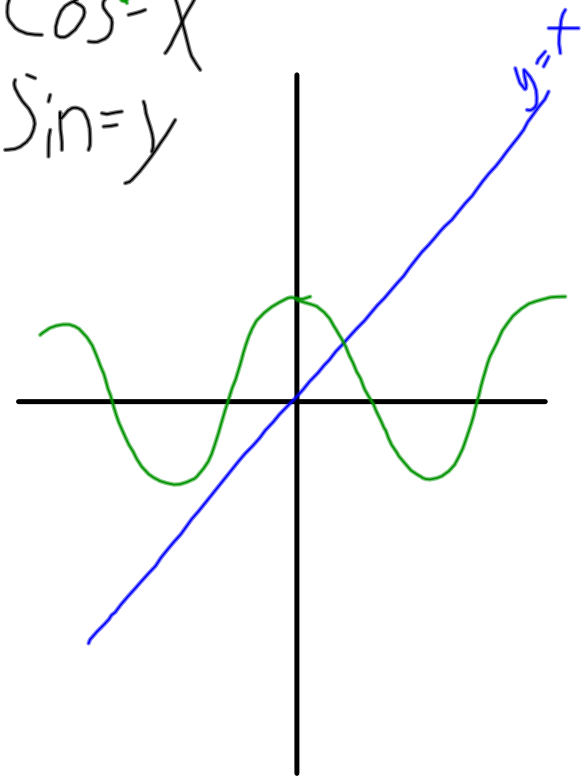
$4x + 3y$

$1(4)x^0 + (1)3y^0$

$(1)(4)(1) + (1)(3)(1) =>$

$\cos = x$

$\sin = y$



3.4/1 $\frac{d}{dx}(2\cos x - 3\sin x)$

$= 2\frac{d}{dx}(\cos x) - 3\frac{d}{dx}(\sin x)$

$= 2(-\sin x) - 3(\cos x)$

3.3/47) a) $x^{-5}+x^5=y$ y'''

$y' = -5x^{-6}+5x^4$

$y'' = +30x^{-7}+20x^3$

$y''' = -210x^{-8}+60x^2$

$\frac{d}{dx}(5x^4)$

$=5\frac{d}{dx}(x^4)$

$=5(4x^3)$

$=20x^3$

b) $y=\frac{1}{x} = y=(x^{-1})$

$y''' = -6x^{-4}$

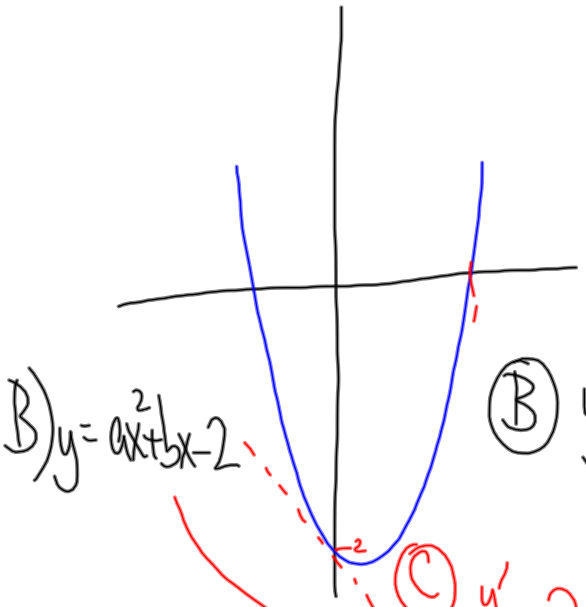
c) ax^3+bx+c

$y' = 3ax^2+b$

$y'' = 6ax$

$y''' = (6a)$

3.3/57) find $y = ax^2 + bx + c$



Ⓐ $y=0$ x-int = 1 (1,0)

Ⓑ $x=0$ y-int = (0,−2) −2

slope @ y-int = −1

Ⓒ $f'(0)$

B) $y = ax^2 + bx - 2$

Ⓑ $y(0) = a(0^2) + b(0) + c = -2$

$c = -2$

Ⓒ $y' = 2ax + b$

$y' = a\left(\frac{d}{dx}(x^2)\right) + b\left(\frac{d}{dx}(x)\right)$

$= a(2x) + b(1)$

$y'(0) = 2a(0) + b = -1$

$\therefore b = -1$

$y = ax^2 - x - 2$

Ⓐ x-int = 1 $y = 0$

$0 = a(1)^2 - (1) - 2$

$0 = a - 3$

$\therefore a = 3$

$y = 3x^2 - x - 2$

$y' = 6x - 1$

The derivative is the f^n that tells you the slope of the tangent line at any pt

write eqn of tangent line at y-intercept

slope: -1

pt: $(0, -2)$

$y - (-2) = -1(x - 0)$

$y = -x - 2$

eqn of tangent

3.3/45 © $y = \frac{x+1}{x}$

He-man way (or Xena-way)

$$\frac{dy}{dx} = \frac{(1)(x) - (x+1)(1)}{(x)^2}$$

$$\frac{d^2y}{dx^2} = \frac{\left(\frac{d}{dx}\left(x-(x+1)\right)\right)(x^2) - \left(x-(x+1)\right)(2x)}{(x^2)^2}$$

$$= \frac{(1-1)(x^2) - \left(x-(x+1)\right)(2x)}{(x^2)^2}$$

LAZY WAY

$$y = \frac{x+1}{x} = 1 + \frac{1}{x}$$

$$= 1 + x^{-1}$$

$$\frac{dy}{dx} = 0 + -x^{-2}$$

$$= -x^{-2}$$

$$\frac{d^2y}{dx^2} = y'' = +2x^{-3}$$

45d $y = (5x^2 - 3)(7x^3 + x)$

$( )( ) + ( )( )$

$[( )( )' + ( )( )'] + [( )( )' + ( )( )']$

$y = 35x^5 + 5x^3 - 21x^3 - 3x$

$= 35x^5 - 16x^3 - 3x$

3.4/2 $f(x) = (\sin x)(\cos x)$

$f'(x) = (\overset{f'}{\cos x})(\overset{g}{\cos x}) + (\overset{f}{\sin x})(\overset{g'}{-\sin x})$

$= \cos^2 x - \sin^2 x = \cos(2x)$

3.4
7) $y = \sec x - \sqrt{2}\tan x$

$\sec x = \frac{1}{\cos x}$

$\tan x = \frac{\sin x}{\cos x}$

MEMORIZATION

$y = \sec x \tan x - \sqrt{2}(\sec^2 x)$

$\frac{d}{dx}(\sec x) = \frac{d}{dx}\left(\frac{1}{\cos x}\right)$

$= \frac{(0)(\cos x) - (1)(-\sin x)}{(\cos x)^2}$

$= \frac{+\sin x}{\cos^2 x} = \left(\frac{1}{\cos x}\right)\left(\frac{\sin x}{\cos x}\right)$

3.4
5) $f(x) = \underbrace{x^3 \sin x}_{\text{PRODUCT}} - \underbrace{5\cos x}_{\text{NOT PRODUCT}}$

$f'(x) = \frac{d}{dx}(\overset{f}{x^3}\cdot\overset{g}{\sin x}) - 5\frac{d}{dx}(\cos x)$

$= (\overset{f'}{3x^2})(\overset{g}{\sin x}) + (\overset{f}{x^3})(\overset{g'}{\cos x}) - 5(-\sin x)$

3.4/7 $\frac{d}{dx}(\sec x + \sqrt{2}\tan x)$

$\sec x = \frac{1}{\cos x}$ .... quotient rule

$\tan x = \frac{\sin x}{\cos x}$ .... quotient rule

OR

MEMORIZE

$\frac{d}{dx}(\sec x) + \sqrt{2}\frac{d}{dx}(\tan x)$

$\sec x \tan x + \sqrt{2}\sec^2 x$

$\frac{d}{dx}\left(\frac{1}{\cos x}\right) = \frac{(0)(\cos x) - (1)(-\sin x)}{(\cos x)^2}$

$= \frac{\sin x}{\cos^2 x} = \left(\frac{1}{\cos x}\right)\left(\frac{\sin x}{\cos x}\right)$

3.2/27(a)

$$\lim_{x_1 \to 3} \frac{x_1^2 - 9}{x_1 - 3}$$

$$\lim_{x_1 \to x_0} \frac{f(x_1) - f(x_0)}{x_1 - x_0}$$

$f(x_1) = x_1^2$

$f(x) = x^2$

$x_0 = 3 = "a"$

3.3/57 =
3.3/3x19

Find a f^n ax^2+bx+c

(A) $y=0$ x-int = 1
(B) $x=0$ y-int = -2
slope @ y-int = -1

(B) $f(0) = a(0)^2+b(0)+c = -2$

$\therefore c = -2$

(C) $f'(0) = -1$

(C) $y' = 2ax + b$

$y'(0) = 2a(0)+b = b = -1$

$y = ax^2 - x - 2$

$0 = a(1)^2 - (1) - 2$

$= a - 1 - 2 = a - 3$

So $a = 3$

$\therefore y = 3x^2 - x - 2$

3.4/5 $\underbrace{x^3 \sin x}_{\text{product}} - \underbrace{5\cos x}_{\text{not a product}}$

$\frac{d}{dx}(\quad) = (3x^2)(\sin x) + (x^3)(\cos x) - 5(-\sin x)$

6 $y = \frac{\cos x}{x \sin x}$

$y' = \frac{(-\sin x)(x \sin x) - (\cos x)\left(\frac{d}{dx}(x \sin x)\right)}{(x \sin x)^2}$

$\frac{d}{dx}(x \sin x) = (1)(\sin x) + (x)(\cos x)$

$y' = \frac{-x \sin^2 x - \cos x(\sin x + x \cos x)}{(x \sin x)^2}$